Influence of aromatherapy on medication administration to residential-care residents with dementia and behavioral challenges

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Abstract

*Thirteen older persons (seven men and six women) in residential care participated as subjects in this study. All participants had histories of confusion due to dementia and were identified by staff as being consistently resistant to medication administration as indicated by vocal outbursts, moving away, or physical combativeness. Subjects were exposed to four aroma interventions during medication administration: 1) lavender vera (*lavendula officinalis*); 2) sweet orange (*citrus aurantium*); 3) tea tree (*malaleuca alternifolia*); and 4) no aroma (control). All medication administrations were videotaped for later data collection. Observers were trained to record frequency and duration of resistive behaviors during medication administration in all four interventions for each subject. Reliability between two observers was extremely high. Results showed no statistically significant differences across all aroma conditions for either resistive behavior or duration of administration. Also, there were no statistically significant differences based on gender. This study indicates that aromatherapy does not reduce combative, resistive behaviors in individuals with dementia. Research with a larger sample in future studies may yield other results.*

Key words: aromatherapy, dementia, combativeness, resistive behaviors

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Introduction

The use of aromatherapy to manage combative behavior in older persons with dementia has grown in popularity over recent years; however, empirical research indicating the effectiveness of this technique is greatly limited. A review of the literature indicated that lavender used either alone or in combination with other aromas can positively influence behavior in older persons. Bphil[1] has reported that lavender and lemon balm oils increase functional abilities and decreased difficult behaviors, while Henry *et al.*[2] have claimed that diffused lavender increases nighttime sleep hours. In a study specific to persons with dementia, Wolfe[3] has postulated that lavender may reduce the need for sedation.

Several studies of EEG activity in normal adults showed that lavender decreased activity while jasmine increased it[4,5]; *e.g.*, jasmine stimulates while lavender relaxes. Furthermore, mental activity and arousal as indicated by EEG measures may occur when persons are not consciously aware of an aroma.[6] With or without conscious awareness, aromas can evoke mood changes and reduce stress responses.[7] Therefore, aromas may have positive influences on the behaviors of older persons who are in residential care, but the range of effects is largely unknown.

The response of individuals to aromas may differ according to background and experience, both of which influence associations. Although there is a paucity of research delineating these associations, the literature refers to the Marcel Proust Phenomenon[8] in which memories of childhood are aroused by the mixed aromas of biscuits and tea. It is possible, therefore, that certain aromas become associated with certain experiences or life periods and as such can trigger memories that have positive or negative effects on behavioral responses.

While aroma may evoke responses in older persons, it is well established that persons experience olfactory changes as they age[9] and that the sense of smell declines over time.[10] Even so, older persons maintain the ability to perceive aroma, even when the identification is impaired due to dementia. This identification impairment is likely due to deterioration in cognitive status and not to olfactory perception.[11] Therefore, persons in their late years may or may not have a hedonic awareness of an aroma, yet the aroma may have an observable effect on their behaviors, even if they cannot recall its name. Consequently, certain aromas may calm older persons with dementia who are confused and behaviorally resistant to receiving medication. Though some research has shown that lavender is conducive to positive responses, other aromas may also have positive effects.

The purpose of this project was to examine the effects of aromatherapy on the administration of medications to persons in residential care with difficult-to-manage behaviors by measuring the following:

- Whether the frequency of resistive behaviors varied during medication administration under the four aromatherapy conditions outlined earlier.
- Whether the time required to administer medications varied under the four conditions.
- Whether gender influenced the duration of medication administration or the frequency of resistive behavior under the four conditions.

Methods

Selection of essential oils

Research as early as the 1920s indicated that aromas had an effect on central nervous system (CNS) activity.[12] Efforts since then to link certain aromas with specific outcomes have yielded a range of results. The essential oils used for this study were selected according to whether or not they were a) popular in their applications, b) safe for individuals, c) recommended for certain behavioral outcomes, and d) familiar enough to be recognized or cause a hedonic reaction. Consequently, the following scents were selected: lavender vera (*lavendula officinalis*), sweet orange (*citrus aurantium*), and tea tree (*malaleuca alternifolia*).

Lavender vera was chosen because of its frequent clinical applications and its occasional inclusion in research studies. It is reported to have calming and soothing qualities that restore balance[13] and is thought to have far-reaching effects on the brain and CNS that serve to relieve nervous tension, decrease exhaustion, lift depression, release anger, and regulate mood swings, among other functions.[14]

Sweet orange was chosen because of its potential to trigger familiar, positive associations. Expressed from orange peel, sweet orange oil has been reported to function as an antidepressant with mildly sedative qualities.[13] The aroma is not harmful when diffused through the environment and it contains coumarins, which give it a distinctive odor.[15] Sweet orange oil likely functions to relieve nervousness, tension, and stress while it encourages energy, counters worry, and balances physical and mental responses.[15]

Tea-tree oil is distilled from the Australian *Melaleuca alternifolia* tree. It was selected for its somewhat medicinal aroma, which is likely unfamiliar to older persons in this country. Its usual purpose is in topical applications to control bacterial, fungal, and viral infections[13]; however, when diffused it has been reported not only to clean the air but also to affect mood.[16] Diffused tea-tree oil has the potential to stimulate energy and to relieve asthenia, nervous exhaustion, and depression.[15]

It is important that essential oils be derived from the concentrated essence of the plant (*e.g.*, the root, seed, trunk, leaf, fruit, or flower).[17] However, these oils may be harmful if used in undiluted or highly concentrated forms. Therefore, the strength of the oil requires careful consideration. Low and high dosages, as determined by frequency of application, may also yield differing effects, depending on the sensitivity of the individual. For instance, more frequent applications may stimulate an active response rather than the quieting response expected with less frequent applications.[10]

In any application, essential oils should not be applied directly to the skin or used internally because they can cause irritation. It is also important to recognize that essential oils are comprised of constituents that can vary from one batch to the other, depending on country of origin, plant variety, time of harvest, weather patterns during the growth cycle, distillation method, equipment used, skill of the distiller, adulterations, testing, or whether the oils are synthetic or pure.[17] These variables may strongly influence the effects of the oils.

Subjects

Administrators at two midwestern residential-care facilities for elderly persons were contacted and informed of the study. Both indicated a strong interest in the project and were asked to identify staff persons who could help recruit suitable volunteers from among the residents. The volunteers chosen were identified by nursing staff as having difficult-to-manage behaviors,

including resistance to receiving medications as indicated by vocal outbursts, moving away, or physical combativeness. A further criterion for inclusion was the ability to perceive aromas.

The legal representatives of participants were asked to sign consent forms allowing their respective wards to participate in the study. Subjects for whom consent was obtained were included after their ability to perceive aromas was assessed. Assessment was made by the experimenter, who met with each potential subject and passed a series of cotton balls containing various scented oils under the subject's nose. Responses to the scented oils were observed, *e.g.*, whether individuals pulled away or leaned forward as the scented cotton ball was presented, whether facial expression changed, or whether verbal comments pertinent to the specific odor were made. In addition, individuals were asked whether they could smell the aroma after each scent presentation. Those indicating yes were identified as viable candidates for the study.

After permission was obtained, subjects at each facility were scheduled for a series of experimental and control aroma conditions during their early morning medication administrations. All subjects took their morning medications under four randomly ordered conditions: aromas lavender vera, sweet orange, tea tree, or no aroma (control). Each of the conditions was repeated four times for a total of 16 administrations. The same staff member dispensed medications to each subject for the 16 total administrations and was directed to use the same approach each time. They were not told what to expect, only that certain residents would have a cotton ball taped to their shirts. All subjects were videotaped for later data collection.

Procedures

The cotton-ball method was selected over the diffuser method due to cost efficiency and convenience for nursing staff. In this method, each essential oil was transferred to a cosmetic size, 100-percent cotton ball. The ball was placed over the mouth of a four-ounce oil bottle, and the bottle was inverted completely for no more than two seconds before it was returned to the upright position.

Twenty minutes before medications were dispensed, a cotton ball containing an essential oil or a cotton ball without oil (the control condition) was taped to the lapel of each participating resident. The same condition was used for all subjects at the same time. The cotton balls were dispensed in the day room, dining room, or any other area ordinarily dedicated to medication administration. In all cases, the aroma condition was well established before residents were expected to receive their oral medications.

Medications were dispensed from a cart that was positioned in a central location in the room. A video camera on a tripod was situated in the area, and was turned on as the staff member prepared to administer the medication to a participant. It was turned off when the oral medication had either been received or eventually rejected. If it was necessary for the staff member to move about the room to reach a subject who was not willing to come to the cart, the investigator moved the camera on the tripod, following the staff member and adjusting the focus as needed.

Data collection

The observer who collected the data from the videotape was trained to set a stopwatch at the beginning of each medication administration event to time its duration. Each event began with the staff member calling the individual's name followed by, "I have your medicine for you." The conclusion of each medication administration was marked by the resident either 1) swallowing the medication, after which the staff member would say "thank you"; 2) attempting to flee after several approaches by the staff; or 3) becoming physically combative after several approaches by the staff. The total number of seconds was recorded for each subject under each condition.

In addition, the observer watching the videotapes was trained to collect time-sampling data for resistive behaviors. This involved recording whether resistive behaviors occurred in each 10-second interval on the videotape. For each interval, the observer marked a plus sign if a resistive behavior occurred and a minus sign if there was no resistive behavior. Resistive behaviors were defined as those that impeded the administration process and included aversive verbal comments and physical gestures such pulling away, spitting, raising an arm, or turning the head away, among others. The frequency of plusses were summed for each condition and entered into a statistical analysis to compare differences between the conditions.

To establish test/retest reliability after training, the observer was required to evaluate one randomly selected videotape of four subjects and to reevaluate the same tape after a period of two days. The data from the two observations were compared to determine the test/retest reliability of the observer. Reliability was determined both for duration of medication administration and number of resistive behaviors exhibited. The first reliability calculation was done by comparing results for duration of medication between the first and second observations of the same subjects. Here, the number of durations for which there were disagreements were subtracted from the number of durations for which there were agreements. The result was divided by the total number of observations and yielded a coefficient of 1.0.

Table 1. Mean frequencies for resistive behaviors				
	Condition			
Participant	Control	Lavender	Orange	Tea tree
Male				
1	1.75	1	1.25	1
2	1	1	1	1
3	1.25	1	1	1
4	1.5	1	1.25	1
5	1.5	1.25	1.75	1
6	1	1	2	1
7	1.25	1.25	1.75	2
Female				
8	1.75	2.25	2.25	2
9	1.25	1	1.25	1
10	1.25	1	1.75	2.5
11	1.5	2	1.75	1.25
12	1	1.25	1	1
13	1.25	1.25	1.75	1

Reliability for time intervals in which there were resistive behaviors was calculated by subtracting the number of intervals in which the test/retest ratings disagreed from the number of intervals in which the ratings agreed, which was then divided by the total number of time intervals in which observations were made. The calculation for resistive behaviors was also 1.0. The perfect agreement of 1.0 for reliability on both measures far exceeded the criteria of .85 considered adequate for this study, and judgments were considered highly reliable.

Data analyses

For each of four aroma conditions, the number of 10-second intervals in which each resident displayed resistive behavior while receiving medications was summed for a frequency count. A one-way analysis of variance was calculated to determine whether there were significant differences among the conditions in terms of resistive response over four trials for each of the four conditions. In addition, the total number of seconds for medication administration under each condition was summed. A one-way analysis of variance was calculated to determine statistically significant differences in duration of medication administration over the four trials for each condition.

Results

Univariate analyses of variance were calculated to answer the research questions concerning frequency of resistive behaviors during medication administration and differences in response between males and females. Table 1 gives the mean frequency of resistive behaviors in both female and male subjects for all four conditions. For females, the analysis of variance to compare frequencies of resistive behaviors across conditions at df = 5 yielded f = 2.555 (p = .520), which was not statistically significant. The frequency of resistive behaviors in male subjects for the four conditions were entered into the

Table 2. Mean duration of medication administration (in seconds)				
	Condition			
Participant	Control	Lavender	Orange	Tea tree
Male				
1	31	8.75	16.5	15.75
2	27.25	28	17.5	25.5
3	18.25	18.25	22.75	15.25
4	23	15.5	14.25	22.5
5	35.75	23.5	25.25	19.5
6	7.75	12.5	31	51
7	23	35.25	26.75	41.25
Female				
8	28	76.75	56.25	58.25
9	10.5	10	14	11.5
10	25.25	17	51.75	61
11	54.75	38	46.5	27.25
12	23.25	29.75	18.5	25.25
13	19	12.5	12.75	8.25

analysis at df = 6 and yielded a frequency of 1.868 (p = .122), which was also not statistically significant. The frequency of resistive behaviors was compared between males and females with a univariate analysis for each of the conditions. In the control condition (df = 1), the differences were not statistically significant (f = .006, p = .938). Male and female subjects did not differ significantly in frequency of resistive behaviors at df = 1 for either the lavender vera (f = 3.510, p = .088), sweet orange (f = .709, p = .418), or tea-tree oil (f = 1.216, p = .294). All results showed no statistically significant differences in frequencies of resistive behaviors across the four conditions for either male or female subjects, and no statistically significant differences occurred between males and females in any one of the conditions.

To answer the research question concerning the affect of the four conditions on duration of medication administration and the differences between males and females, univariate analyses of variance were calculated. Table 2 gives the mean duration in seconds required to administer medications to all male and female subjects in all conditions. For female subjects across the four conditions, differences in time of administration were not statistically significant at df = 5 (f = 3.877, p = .868). Nor was there a statistically significant difference in duration among male subjects at df = 6 when compared across the four conditions (f = .911, p = .597).

In addition, a comparison between males and females at df = 1 yielded no statistically significant difference in duration of medication administration under any of the four conditions. For the control condition, the analysis yielded a frequency of .208 (p = .657); for lavender vera, the frequency was 1.060 (p = .325); for sweet orange, the frequency was 1.987 (p = .186); and for tea-tree oil, the frequency was .209 (p = .657).

Discussion

The four conditions did not yield statistically significant differences for either male or female subjects in frequencies

of resistive behaviors or in duration of medication administration. In addition, there were no statistically significant differences between responses for males and females in any one of the conditions. The design of the study may not, however, have allowed for complete observations of behaviors within the conditions. Some observations of female subjects indicated aggressive or resistive behaviors after the aroma but before the medication administration in all conditions. Male subjects, on the other hand, tended to display aggressive behaviors only after they received their medications. Therefore, these aggressive behaviors were not included in the data collection. It's interesting to note that such aggressive behaviors seemed to occur with all aromas.

Residents who were not subjects in the study and were not themselves wearing a cotton ball displayed behaviors incongruous with their usual patterns when in the same room as the subjects. For instance, one man who had not spoken in several months was verbal during the sweet-orange aroma condition when subjects around him were wearing the scent. Another resident, who was usually cooperative, became aggressive and threw his meal tray when the sweet orange scent was used in same room. From these informal observations, it is evident that scent from the essential oils permeated the environment whether or not an individual was wearing it and had an affect on people's behavior whether or not it was intended. Furthermore, one scent can evoke desirable responses in certain individuals (engagement in verbalization) while it evokes undesirable responses in others (physical aggression).

It is interesting that no differences in behavior or duration of medication administration occurred with lavender vera, despite reports in the literature about its calming effect. The use of lavender vera, at least as indicated in this study, does not facilitate the administration of medications in persons with a tendency toward difficult-to-manage behaviors.

Conclusion and recommendations

Results of this study indicate that neither lavender vera, sweet orange, or tea-tree aromas alter resistive behaviors or duration of medication administration when the data collection interval includes only the actual administration event. For future research, extending the timeframe for data collection for longer durations is recommended. Informal observations in this study indicate that data taken prior to, during, and following medication administration may reveal more comprehensive information concerning the effects of aromatherapy on behavior in this population. A study that examines longer timeframes to allow for longer response latencies is recommended.

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